

THE INFLUENCE OF ATTACHMENT STYLE AND SELF-REGULATION ON CHILDREN'S SOCIAL COMPETENCE

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The purpose of this study is to explore the relationship between attachment style and social competence with self-regulation as a mediating variable. This study is based on secondary data from the National Institute of Child Development and Child Health Study of Early Childcare and Youth Development (NICHD SECCYD). Recruitment began in 1991 and ended in 2007 with 1,009 families. For the purpose of the current study, 824 participants were selected because they had complete data for two measures, the Strange Situation at 36 months of age and Social Skills Rating Scale (SSRS) at first grade, fourth grade and fifteen years of age. Findings of this study suggest that attachment style at 36 months of age is associated with social competence at first grade, fourth grade, and 15 years of age. Further analysis suggests there is a statistically significant difference in mean social skill scores for securely attached and insecurely attached children at each of the three time points. Examination of self-regulation (at first grade, fourth grade, and 15 years of age) as a mediator between attachments at 36 months and social competence (at first grade, fourth grade and 15 years of age) revealed that self-regulation was a significant mediator in explaining the relationship between attachments at 36 months and social competence at all three time points.

THE INFLUENCE OF ATTACHMENT STYLE AND SELF-REGULATION ON
CHILDREN'S SOCIAL COMPETENCE

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CHAPTER 1: INTRODUCTION

The quality of early parent–child attachment has long-term effects on child development. In fact, research spanning across time demonstrates that secure parent–child attachments are associated with developmental benefits. For example, Ainsworth (1979) notes [when comparing children who are anxiously attached to children who are securely attached], securely attached children at one year of age are later more cooperative and positive and less aggressive and/or avoidant toward their mothers and other less familiar adults. Moreover, Bohlin, Hagekull and Rydell (2000) concluded, children who had been securely attached as infants were more socially active, positive and popular at school age, and tended to report less social anxiety when compared to children with insecure attachment styles.

However, in contrast to secure attachments, longstanding research on insecure attachments demonstrates that parent-child interactions, which result in persistent conflict during early childhood, are likely to produce strong anxiety and unhappiness in both the parent and child (Bowlby, 1982). It is also suggested that poor attachment quality is associated with psychopathology later in life (Bowlby, 1982). That is insecure attachment styles are associated with numerous other negative outcomes including: 1) lack of competence in peer interactions, 2) social withdrawal, 3) less interest in peer relations, 4) greater externalizing behaviors (problem behavior), and 5) more internalizing features such as social anxiety and depression (Barone & Lionetti, 2012; Bohlin, Hagekull, & Andersson, 2005).

Relevance

As bolstered by decades of research, children with secure attachments to significant caregivers tend to have greater social competence and greater self-regulation when compared to children with insecure attachments. Children with insecure attachments tend to show deficiencies

in social competence and demonstrate maladaptive self-regulatory skills when compared to securely attached children. Surprisingly, no research to date explores the plausible interplay among attachment style, self-regulation, and social competence. Specifically, understanding the impact of self-regulation on insecure attachments and children's social competence could provide practitioners working with children and their families a basis to improve children's social competence, ultimately leading to enhanced future success for children. That is, teaching children self-regulatory skills may help mediate the possible deleterious effects associated with insecure attachments and later social deficits.

Concepts

Attachment Theory. Attachment, simplistically stated, is a close emotional bond between two people, such as the bond between a mother and her child (Ainsworth & Bell, 1970). John Bowlby's Attachment theory is grounded in the notion that primary caregivers who are available and responsive to an infant's needs allow the child to develop a sense of security. The type of attachment is apparent during separation from and reunification with the primary caregiver. During times of stress or separation, children exhibit attachment behaviors, which include following, crying out and clinging to, in order to maintain proximity to their primary caregiver to ensure their safety. By 6 months of age, children's attachment behaviors are apparent and are directed toward a particular individual, their attachment figure. Children's attachment behaviors are dependent upon the length of time the primary caregiver has been absent and their pattern of behavior. The primary caregiver's responses to these behaviors influence the child's attachment style and the child's responses to his or her primary caregiver in turn influence the primary caregiver's responses. Thus, the primary caregiver and the child mutually influence the type of attachment style (Bowlby, 1982).

When in the proximity of the attachment figure, the child feels secure and willing to explore his or her environment. Children ages 1 to 2 years, in an unfamiliar situation, will orient to their attachment figure and keep his or her whereabouts in mind while continuing to explore. However, when children perceive a threat to separation, exploration ceases and children experience anxiety and true sorrow; these emotions are likely to arouse fear and anger. During the reunion phase the child may either cease activity, orient to the attachment figure and smile or if crying, the child may stop when picked up by the attachment figure. If distressed, the child may resist being put down. Once attachment behaviors cease, children feel safe to explore their environment (Bowlby, 1982).

Children's attachment behaviors remain strong up until almost the end of the third year. By age three, children begin to feel more comfortable in unfamiliar situations as long as the subordinate figure is someone the child knows, the child is healthy and unalarmed, and the child knows where his or her attachment figure is and feels confident he or she will return. With age, the fear response is activated less; however, attachment behaviors remain (Bowlby, 1982).

Ainsworth, expanding upon Bowlby's attachment theory, defined three types of attachment styles. These attachment styles are based on the Strange Situation, a structured research protocol, which is comprised of a series of events that are intended to be increasingly stressful for the child. The three types of attachment styles include secure, insecure avoidant, and insecure ambivalent/resistant. The protocol for the Strange Situation is as follows: 1) parent and infant are left alone, 2) stranger joins parent and infant, 3) parent leaves stranger and infant alone, 4) parent returns and stranger leaves, 5) parent leaves and child is left alone, 6) stranger returns and 7) parent returns and stranger leaves. Based on the child's reaction to the Strange Situation, he or she is classified by type of attachment style (Ainsworth, 1979).

Ainsworth found that securely attached children use their mothers as a secure base from which to explore. During the separation episode, securely attached children cease exploration and are likely to become distressed. During the reunion episode they seek contact with, proximity to, or interaction with their mother. Children who are insecure ambivalent tend to show signs of anxiety in the pre-separation episodes. They are extremely distressed by separation and in the reunion episodes they seek close proximity to her, yet resist contact or interaction. Insecure avoidant or alternatively termed insecure resistant children rarely cry in the separation episodes and, in the reunion episodes, avoid the mother, either exhibiting proximity-seeking and avoidant behaviors or ignoring her altogether (Ainsworth, 1979). A fourth style, disorganized attachment, was later added by Mary Main, a colleague of Ainsworth's. Children with disorganized attachment exhibit unusual behavior during the reunion phase. Children with this attachment style want to seek proximity to their attachment figure but appear fearful to do so (Main & Solomon, 1986).

A child's continued attachment to his or her mother is influenced by distinctive patterns of maternal care (Tracy & Ainsworth, 1981), commonly referred to as parenting. Parenting is often defined from two vantage points, positive parenting and negative parenting. Positive parenting includes behaviors such as support, nurturance, warmth and appropriate discipline, which promote positive parent-child relationships (Tildesley & Andrews, 2008). Hence, positive parenting promotes secure attachment, which has lasting effects on children's social and emotional development (Bohlin, Hagekull & Rydell, 2000). However, as noted previously, if parent-child interactions result in persistent conflict during early childhood, a sign of negative parenting, each is likely to experience unhappiness, strong anxiety and the child specifically, may experience maladaptive development. For example, when parents do not respond to

attachment behaviors, children often become clingy and difficult to soothe. Over time these feelings and behaviors can intensify (Bowlby, 1982), leading to trouble self-regulating, which has the potential to spawn poor social competence. Therefore, it can be deduced that children with insecure attachments may have trouble self-regulating, which is likely to lead to poor social competence. This lack of control and competence could in turn strain the parent-child attachment; demonstrating that attachment is a reciprocal process of the child and parent mutually influencing each other.

Social Competence. The definition of social competence varies within empirical literature. A review of conceptual qualifications by Rose-Krasnor (1997) revealed a plethora of definitions with varying restrictive qualities. To streamline conceptual qualification, Rose-Krasnor (1997) defines social competence from three levels: skills, index and theoretical. Social competence defined from the skill level includes specific abilities or skills that have been identified as a measure of one's social competence (Rose-Kransor, 1997), such as perspective taking, communication, empathy, affect regulation and social problem solving (Rubbin, Bukowski & Parker, in press, as cited in Rose-Krasnor, 1997). Social competence defined at the index level is success in achieving one's personal goals and feelings of efficacy in social interactions, positive relationships with peers and adults, achieving an appropriate place in social groups, and fulfilling society's expectations for responsible social behavior. At the theoretical level social competence is defined as effectiveness in social interaction (Rose-Kransor, 1997). Ineffective responses to social interactions, such as internalizing behaviors and externalizing behaviors, demonstrate a lack of social competence. Externalizing behaviors are uncontrollable aggressive acts frequently displayed by a given child (Rubin, Hastings, Chen, Stewart &

McNichol, 1998). Internalizing behaviors are inner-directed and over-controlled behaviors (e.g. anxiety, depression) (McCulloch, Wiggins, Joshi & Sachdev, 2000).

Self-Regulation. Self-regulation is the ability to control, direct and plan in order to achieve a desired result (McClelland, Cameron, Connor, Farris, Jewkes & Morrison, 2007). Self-regulation includes the child's ability to regulate his or her emotions and behavior and internalize rules of conduct (von Suchodoletz, Trommsdorff & Heikamp, 2011). Emotion regulation consists of internal and external processes involved in initiating, maintaining, and modulating the occurrence, intensity, and expression of emotions (Morris, Silk, Steinberg, Myers, & Robinson, 2007). Behavior regulation is defined as the ability to express or control one's impulses, motor responses, and other behaviors (Wong et al., 2006). Internalization of rules of conduct involves adopting and incorporating socially acceptable rules into one's working model, a cognitive framework for understanding the self and others, so that acting according to social standards is not only motivated by external consequences but increasingly by internalized rules (Grusec & Goodnow, 1994). Some researchers have included cognitive-regulation as a component of self-regulation. Cognitive regulation is essentially executive function. Executive function is the conscious and unconscious regulation of cognitive skills, which allow one to regulate one's behavior (Riggs, Jahromi, Razza, Dillworth-Bart & Mueller, 2006). Alternatively stated, executive function allows one to manage one's thought processes. Executive function aids in "planning, organizing, strategizing, paying attention to and remembering details, and managing time and space" (National Center for Learning Disabilities, 2014).

CHAPTER 2: Literature Review

A literature review is a systematic review of empirical articles, which relate to the specified research question(s). In conducting the systematic review, databases including PsychINFO, Academic Search Complete, SocINDEX, Education Research Complete, ERIC and Google Scholar were selected using the following key words: attachment, attachment style, insecure attachment, secure attachment, self-regulation and social competence. Articles from the year of 2000 to the present limited the search to the most recent literature. However, classic articles written by John Bowlby and Mary Ainsworth, significant individuals of attachment theory, were also retrieved. A total of 31 articles were reviewed.

The Role of Attachment in Self-Regulation

In general, current research supports the link between attachment style (secure and insecure) and self-regulation (Martins, Soares, Martins, Tereno & Osorio, 2012). That is, secure attachment is associated with effective self-regulatory skills (Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002; Brumariu, Kerns & Seibert, 2012; Waters, et al., 2010), whereas insecure attachments are associated with poor self-regulatory skills (Mills-Koonce, Propper & Barnett, 2012; Martins et al., 2012) including over- and under- regulation (Martins et al., 2012). Interestingly, Martins and colleagues (2012) compared attachment style to emotion regulation and behavior regulation and they concluded that attachment style predicts emotion regulation better than behavior regulation. In other words, children with secure attachments have developed adaptive emotional regulatory skills that allow them to effectively resolve their emotional experiences more than their ability to control their physical acts. Moreover, other researchers have concluded that attachment style promotes self-regulation when regulation occurs in a social context (Drake, Belsky & Fearon, 2013). Thus, the presence of others encourages one to

demonstrate greater self-regulation. Based on the available literature, it appears that attachment style predicts self-regulation in social settings but attachment style is more predictive of emotional regulation when compared to behavioral regulation.

Securely attached children employ more effective regulatory strategies such as redirection of attention, comfort seeking behaviors, learning more about the source of distress and changing the offending source, when compared to children with insecure attachments (Gilliom et al., 2002). Gilliom and colleagues (2002) found that boys classified as secure at age 1.5 years were more likely to disengage from frustrating stimuli and to seek information regarding when and how the frustrating stimuli could be eliminated, a means to regulate their emotions. These two strategies are in opposition to focusing on the frustrating stimuli, a behavior often demonstrated by insecurely attached children (Gilliom et al., 2002). Similarly, children 10 to 12 years of age with secure attachments reported lower levels of anxiety, greater active coping and less difficulty in identifying their emotions—a demarcation of greater self-awareness—when compared to their insecure counterparts (Brumariu, Kerns & Seibert, 2012).

Coming from a different vantage point, Waters and colleagues (2010) stated that maternal figures with securely attached children often have discussions of their child's prior negative emotions, which could further explain their child's enhanced self-awareness. It was noted that during these conversations, parents validated children's emotions and discussed methods of self-regulation, which presumably led to children's enhanced understating of emotions and willingness to participate in these conversations. That is, in Waters and colleagues' sample of 73 mothers and their 4.5 year old children, a significant correlation was found between maternal validation and attachment security. In addition, a significant direct correlation was found between attachment security and decreased child avoidance in conversations about prior negative

emotions (Waters, et al., 2010). In other words, one reason insecurely attached children are less willing to participate in discussions may be because they have mothers who do not validate their emotions. Therefore, children with a secure attachment are likely to demonstrate superior self-regulation when compared to children of insecure attachments.

It has been concluded that when examining insecure attachment styles and self-regulation, insecurely attached children have greater difficulty regulating emotions. That is, difficulty self-soothing at 6 months of age was found to be associated with a greater likelihood of having an insecure-ambivalent attachment at 6 months of age (Mills-Koonce, Propper & Barnett, 2012). This finding implies that children with insecure-ambivalent attachments experience greater difficulty regulating their emotions. Moreover, insecure-avoidant attachment is associated to the development of over-regulation, a maladaptive emotional regulation style in infancy (Martins et al., 2012). Over-regulation is the minimization of the expression of negative emotions (Cassidy, 1994) such as anger, fear, and frustration. In fact, insecure-avoidant attachment was found to be a significant predictor of over-regulation when compared to under-regulation (Martins et al., 2012). Research on this phenomenon indicates insecure-avoidant children over-regulate their emotions to demonstrate they are cooperating and they will not seek comfort from the parent as to not upset her and to keep her within proximity (Cassidy, 1994). In a sample of eighty-seven 10 to 12 year old children, disorganized attachment was related to difficulty with emotion regulation. Children with disorganized attachment expressed higher levels of catastrophizing and difficulty problem solving/coping (Brumariu, Kerns & Seibert, 2012).

Genetics may influence the relationship between attachment style and self-regulation. When examining children's attachment security and the effect of genotypes (5-HTTLPR

polymorphism), Kochanska, Philibert and Barry (2009) found that specifically having a short allele (ss or sl) was significantly associated with diminished self-regulatory capacity of children ages 2 to 4.5 years who had been insecurely attached to their mothers at the end of the first year. This association was absent for securely attached children, suggesting attachment security buffers possible genetic risks of maladaptive self-regulation. Hence, insecure attachment is associated with genotypic risks for maladaptive self-regulatory skills. Although greater exploration is needed to explain the genetic link, such research could provide a richer understanding of the influence of attachment style on children's self-regulation.

The Role of Self-Regulation in Social Competence

Children who can encode, interpret and reason about social and emotional information, skills associated with self-regulation, demonstrate positive social behaviors. Positive social behaviors are associated with more frequent displays of social competence (Mckown, Gumbiner, Russi & Lipton, 2009). In addition to positive social behaviors, some researchers conclude self-regulation is indicative of children's social competence (Diener & Kim, 2004; and Mathieson & Banerjee, 2010) and adolescents' social competence (Buckner, Mezzacappa, William & Beardslee, 2009). However, other factors such as positive emotionality (Garner & Waajid, 2012), temperament (Diener & Kim, 2004), language development (Aro, Eklund, Numi & Poikkeus, 2012) and higher order thinking (Scott, Barbarin & Brown, 2013) may influence the role of self-regulation on social competence.

In a sample of 140 six-year-old children with intellectual disability (n = 58) and without intellectual disability (n = 82), self-regulation predicted later social competence and relationships with teachers and peers for both groups of children (Eisenhower, Baker & Blanche, 2007). Similarly, Barbarin and colleagues (2013) assessed psychosocial competence in African

American and Latino boys' (4 to 8.5 years of age), as measured by self-regulation, interpersonal skills, and positive relationships with peers and teachers. Teachers noted strengths in the boys' self-regulation and teacher-student relationships. These findings indicated that African American and Latino boys who self-regulate have successful teacher-student relationships when compared to African American and Latino boys who have difficulties self-regulating. However, teacher ratings of peer relations of African American and Latino boys, who exhibited self-regulation skills, were less positive than teacher ratings of teacher-student relations. Perhaps children employ greater self-regulation in the presence of a superordinate figure, leading the superordinate figure to classify them as more competent. In contrast, Davido and Gruse (2006) conclude children who can self-regulate experience positive peer interactions and experience fewer peer confrontations than children who lack self-regulatory skills. In fact, emotion regulation specifically, was found to be an important predictor for social skills and positive student-teacher relationships (Spritz, Sandberg, Maher & Zajdel, 2010). As a result, children who can self-regulate, experience more positive relations than children who have maladaptive self-regulation. This finding is in congruence with other empirical findings.

Positive emotionality (Garner & Waajid, 2012), temperament (Diener & Kim, 2004), language development (Aro et al., 2012) and higher order thinking (Scott, Barbarin & Brown, 2013) appear to interact with children's self-regulatory skills and their subsequent social competence. Positive emotionality, a component of self-regulation, was negatively associated with classroom behavior problems and positively associated with parent assessed social competence in a sample of 74 preschool children (Garner & Waajid, 2012). Thus, self-regulation is associated with fewer problem behaviors and greater social competence. Similarly, children temperamentally prone to experience high levels of negative affect and low self-regulation

exhibit more externalizing behaviors and less prosocial behavior when compared to children with low or high negative affect and high self-regulation. Therefore, high negative affect does not appear to be related to negative outcomes in social competence (as measured by prosocial and externalizing behavior) unless it is paired with poorer self-regulation skills. These results are based on a sample of 110 children with a mean age of 36 months. In general, it appears that self-regulation better predicts social competence than child temperament (Diener & Kim, 2004).

According to Aro and colleagues (2012), behavioral regulation skills mediate the relationship between early language development and social outcomes for children who are at-risk for language difficulties. However, children with language difficulties who have age-appropriate self-regulation skills did not differ in social competence from children with age-appropriate language and self-regulation skills. Therefore, if language development is typical, self-regulation aids in predicting social competence. In contrast, if language development and self-regulatory skills are below average, children may exhibit less social competence (Aro et al., 2012). Interestingly, cognitive regulation, a domain specific component of self-regulation, is presumed to have a longitudinal relationship with social competence. Scott, Barbarin and Brown (2013) evaluated social competence (behavior regulation, emotion regulation, social communication skills, peer social skills, and student–teacher closeness) and cognitive regulation (such as inhibitory control, attention shifting, and working memory) by means of higher order thinking (the ability to discern categories and patterns, to infer nonevident connections, and to draw conclusions from observations) in a sample of 108 prekindergarten boys, identified as black. The researchers concluded higher order thinking must precede the development of social competence. This finding implies self-regulation, most notably cognitive regulation, is essential to the development of social competence.

The Role of Attachment in Social Competence

Current studies have corroborated Ainsworth's paradigm that attachment is influential to social development. Research on attachment security specifically highlights the significance of secure mother-child attachment on children's development of social competence. Both mother-child and father-child secure attachments predict children's social competence (Diener, Isabella, Behunin & Wong, 2008; and Booth-Laforce, Oh, Kim, Rubin, Rose-Krasnor & Burges, 2006) along with prosocial behavior and peer relations (Richaud de Minizi, 2010). However, mother-child attachment appears to be the most influential when compared to father-child attachment (Richaud de Minizi, 2010), which may help to explain why mother-child attachment style research dominates the literature.

Bohlin, Hagekull, and Andersson (2005) examined social competence and mother-child attachment by operationally defining social competence as positive social expectations, empathy, a sense of self-worth and efficacy. Their analysis revealed that attachment security predicts social competence. In fact, the results indicated that securely attached children are more likely than those insecurely attached to succeed in establishing peer relations.

Although some studies imply a direct relationship between attachment and social competence, other studies suggest parental behaviors, such as maternal expressiveness (Laible, 2006), parental responsiveness (Rispoli, McGoey, Koziol & Shreiber 2012), and sensitive care (Belsky & Fearon, 2002) may mediate the relationship. For example, attachment security and maternal expressiveness may interact to produce social competence. In particular, children who are securely attached and have expressive mothers were rated by mothers as engaging in more prosocial behavior and less aggressive behavior (Laible, 2006). However, this finding appears to be biased. This is because maternal ratings of child behavior are often evaluated more favorably

and therefore may not be representative of the child's true behavior. Examining another parental characteristic, parental responsiveness, of 6,850 parent-child dyads from age 9-months to kindergarten, Rispoli and colleagues (2012) concluded that parental responsiveness and attachment security aid in the formation of social competence over time. The researchers assert that parenting behaviors may strengthen attachment security, which in turn influences social competence. Belsky and Fearon (2002) examined sensitive care. Sensitive care is defined as the mother's emotional availability and responsiveness to her child. They found securely attached children at 15 months, who received sensitive care at 24 months, demonstrated greater cooperation (social competence), expressive and receptive language, school readiness and less behavior problems (problem behaviors included limitations in self-regulation and social competence) than children who were insecurely attached at 15 months and received insensitive care at 24 months. Children with secure attachment histories at 3 years of age, who received subsequent sensitive care, performed better on average in cooperativeness (a measure of social competence), expressive language, receptive language and school readiness, outperforming children with insecure attachment histories at age 3 who had subsequent insensitive care, in all four areas. Overall, attachment security along with sensitive parenting promotes the best outcomes for children.

Insecure attachment is a prominent factor used to explain the discrepancy between children who are socially competent and children who are not. As described by Bohlin, Hagekull, and Andersson (2005), insecure-avoidant and insecure-ambivalent children appear to socially withdraw and show less interest in establishing peer relations, potentially leading to internalizing problems such as social anxiety and depression. They further concluded that children who had been securely attached as infants and children and those who had been

insecure-ambivalent as infants, were rated equally in empathetic relating—the ability to empathize with another. However, children who were insecure-avoidant as infants rated lower in empathetic relating than those who had been secure and those who had been insecure-ambivalent (Bohlin, Hagekull, & Andersson, 2005). This conclusion suggests that insecure attachments in general, are social withdrawal, poor peer relations, possible internalizing problems, and difficulty empathizing. Furthermore, children with insecure attachments are less competent in interactions with peers and present more internalizing features. Children classified as insecure-disorganized present more externalizing behaviors and to a lesser degree more internalizing behaviors and behavior problems. In fact, an association was found between attachment disorganization and poor social competence including an increase in problem behavior (Barone & Lionetti, 2012).

Parental factors influence insecure attachment and child social competence. For example, children who reported low levels of attachment security and high levels of anxiety associated with parental conflict viewed themselves as less socially competent (Isabella & Diener, 2010). This implies that parental interactions and parental conflict management style, and therefore parental social competence, influences mother-child attachment and child social competence. In fact, insecurely attached children of highly coercive parents displayed less emotional competence than securely attached children and other insecurely attached children (Kidwell, Young, Hinkle, Ratliff, Marcum & Martin, 2010). Thus, it appears that parental factors may moderate the relationship between attachment and social competence.

Current Study

As reviewed up to this point, there is sufficient empirical evidence for expecting insecure attachments to be associated with insufficient self-regulatory capacity over the course of development, while secure attachments are associated with greater self-regulatory abilities.

Furthermore, there is sufficient empirical evidence that self-regulatory ability is a determinant of social competence and it is known that social competence is essential for later academic success (Wentzel, 1991). However, most of the research on attachment style and self-regulation has been limited to the study of children at a single point in time, not examining the long-term impact of early attachment style and later self-regulatory skills. Moreover, few if any, studies have examined the plausible hypothesis that self-regulatory capacities may mediate the influence of attachment style on later social competence.

The purpose of the present study is to examine the relationship among attachment styles, self-regulation, and social competence. Three research questions, grounded in Attachment theory, guided this study: 1) Overall, is there a relationship between attachment style (secure and insecure) and social competence at first grade, fourth grade, and 15 years of age? 2) Is there a significant difference in social competence, as measured by mean social skills scores, for children of secure and insecure attachments at first grade, fourth grade, and 15 years of age? 3) What is the role of self-regulation, at first grade, fourth grade and 15 years, in mediating insecure attachments at 36 months of age and social competence at first grade, fourth grade and 15 years of age? Based on the current literature, the researcher hypothesized that children with secure attachments will demonstrate greater social competence than children with insecure attachments. The researcher further hypothesized that self-regulation would mediate the relationship between insecure attachment styles and social competence to better explain the relationship between attachment and social competence.

CHAPTER 3: METHOD

Sample

This study is based on secondary data from the National Institute of Child Development and Child Health Study of Early Childcare and Youth Development (NICHD SECCYD). Participants of the NICHD SECCYD study were recruited from designated hospitals at 10 data collection sites. Recruitment began in 1991 with 1,364 families and was completed in 2007 with 1,009 families remaining in the final phase of the study. Families (either two parent or single parent) with full-term, healthy newborns were enrolled. Participants were randomly selected to ensure that the recruited families: (a) included mothers who planned to work or go to school, either full time or part time, and mothers who planned to stay at home with the child in his or her first year and (b) reflected the demographic diversity (economic, educational, and ethnic) of the sites. Mothers younger than 18 years of age at the time of child's birth, families who did not anticipate remaining in the catchment vicinity within the following three years, children with obvious disabilities at birth or who remained in the hospital for more than seven days after birth, and mothers who were not sufficiently conversant in English were excluded from the study (NICHD, 2012).

The data available for the 1,009 families was reviewed. If complete data was available for the Strange Situation procedure at 36 months of age and the Social Skills Rating Scale (SSRS) at first grade, fourth grade, and 15 years, participant data was retained for analysis of the current study. Eight hundred and twenty four participants met the criterion. Of the 824 participants, 85.3% identified as white, 10.6% identified as black or African American, 2.2% identified as Asian or Pacific Islander and the remaining 0.4%, identified as American Indian, Eskimo or Aleutian. The mean age of mothers that participated in the study was 29 years.

Measures

Measurements used in this study were selected from the NICHD SECCYD dataset to provide information on (a) attachment style, (b) self-regulation, and (c) social competence. Two measures were used to assess the three components: the Strange Situation, and Social Skills Rating Scale.

The Strange Situation. Around 36 months of age, a modified Strange Situation procedure was used to evaluate each child's attachment style to his or her mother. The modified version of the Strange Situation was as follows: 1) mother and child in playroom for 3 minutes, 2) mother leaves the room following a knock on the playroom door, 3) after 3 minutes the mother returns, 4) the mother later departs for the second time after a knock on the door, 5) after 5 minutes the mother returns. Coders reviewed video recordings to assess children's attachment style. For the purpose of this study the 36-month 4-way attachment category rating was used to identify children's attachment style. The attachment styles were categorized in the following ways: (A) insecure avoidant, (B) secure, (C) insecure ambivalent/resistant and (D) insecure controlling/other. For the purpose of this study, children identified as insecure controlling/other either take control of the reunion or show combinations of behaviors such as avoidance and ambivalence, or avoidance and controlling behaviors, during reunions. Attachment classification was determined by interrater agreement of 75.6%. Each pair of coders scored a total of 1,140 tapes from the 10 collection sites (NICHD, 1999).

The Social Skills Rating System. The SSRS is a norm-referenced behavior and personality tool used to assess children's social behavior in preschool, elementary school, and secondary school age children. The instrument measures children's social behaviors through social skills, problem behaviors, and academic competence. These three factors comprise the

assessment tools' three scales. The social skills scale contains five subscales: cooperation, assertion, responsibility, empathy, and self-control. The problem behavior scale contains three subscales: externalizing problems, internalizing problems, and hyperactivity. The final scale, academic competence, is a single scale with no subscales. In addition to the different versions (preschool, elementary, and secondary), the assessment tool is further differentiated by evaluator type (parent/primary caregiver, teacher, and student; Community-University Partnership for the Study of Children, Youth, and Families, 2011).

For the purpose of this study, the self-control, 10-item, subscale of the SSRS parent form, was used to measure self-regulation. The parent form was selected, as it was the only form that was completed at each phase of the study. Self-control defined by the SSRS includes “behaviors that emerge in conflict situations such as responding or speaking in an appropriate way, receiving criticism well, and controlling temper” (NICHD, 2003a). Parents rate how often these social behaviors occur on a 3-point scale (0 = never, 1 = sometimes, 2 = very often). Higher scores indicate greater self-control as perceived by the child's mother/alternate primary caregiver. The self-control subscale demonstrates an internal reliability of .82 (NICHD, 2001), .83 (NICHD, 2003b) and .83 (NICHD, 2007) at first grade, fourth grade and 15 years, respectively.

To assess social competence, the raw scores from the total social skills scale of the SSRS were evaluated (items 1-38). Higher scores indicate greater socially acceptable learned behaviors as perceived by the child's mother/alternate primary caregiver. At each time point, first grade, fourth grade, and 15 years, the scale measures demonstrate high internal reliability of .88 (NICHD, 2001), .91 (NICHD, 2003b), and .91 (NICHD, 2007) respectively.

Procedure

Permission to conduct this research was granted by the Institutional Review Board (IRB) at East Carolina University. After receiving IRB approval, the appropriate information was submitted to The Inter-university Consortium for Political and Social Research to gain access to the requested dataset. Once meeting the necessary criteria, access to the dataset was granted. All the relative measures were reviewed to guarantee the described assessments were the most appropriate measures used to assess the three variables (attachment style, self-regulation and social competence).

After selecting the specified variables for analysis, there were 1,364 participants with some or all the necessary data available. To ensure the most accurate results, participants with missing data were excluded from the current study. A total of 824 participants with no missing data were used for data analysis.

A correlation analysis was preformed to determine the strength and direction of the hypothesized relationship between attachment style (secure and insecure) and social skills at first grade, fourth grade, and 15 years of age. Next, an independent samples t-test was conducted to determine if a statistically significant difference exist in mean social skills scores for securely attached and insecurely attached children at first grade, fourth grade and 15 years. To examine the role of self-regulation in mediating the relationship between attachment style and social competence, three separate mediation analyses were conducted using PROCESS by Dr. Andrew Hayes (2013). To help ensure the results generated from the sample would be similar to population results, bootstrapping, a non-parametric method, was used to test the indirect effect. In essences, bootstrapping is a method used to generate a specified number of samples from the

original sample. This statistical procedure aids in enhancing external validity (Bollen & Stein, 1990).

CHAPTER 4: RESULTS

Attachment Styles

Of the 824 child participants, at 36 months of age, 62.9% ($n = 518$) were classified as securely attached. The remaining 37.1% ($n = 306$) were identified as insecurely attached. Of the participants with insecure attachments, 12.7% ($n = 39$) were classified as avoidant, 42.5% ($n = 130$) were identified as ambivalent/resistant and 44.8% ($n = 137$) were described as insecure other.

Attachment Style and Social Competence

As illustrated in Table 1, when examining the relationship between attachment style (secure and insecure) and social competence at first grade, the analysis revealed a significant yet weak, positive correlation, $r = .079$, $n = 824$, $p = 0.023$, with secure attachments associated with greater social competence at first grade. When measuring social competence at fourth grade, a significant but weak positive, correlation was produced, $r = .101$, $n = 824$, $p = 0.004$. This correlation demonstrates that as attachment security increase so does social competence at fourth grade. A significant although weak positive correlation was revealed between attachment style at 36 months and social competence at 15 years of age, $r = .085$, $n = 824$, $p = .015$, indicating that as attachment security at 36 months improves, social competence at 15 years increases.

Attachment Styles and Social Competence Comparisons

The results from the independent samples t-tests demonstrated a significant difference in mean social skills scores for securely and insecurely attached children at all three time points. That is, there was a significant difference in first grade scores for securely attached children ($M = 57.60$, $SD = 8.73$) and insecurely attached children ($M = 56.13$, $SD = 9.20$; $t(822) = -2.28$, $p = .02$, two-tailed). The magnitude of the differences in the means (mean difference = -1.46, 95%

Table 1

Attachment Style and Social Competence

	1	2	3	4
1. Attachment Style (36 months)	824			
2. Social Competence (First grade)	.079* .023	824		
3. Social Competence (Fourth grade)	.101** .004	.696** .000		
4. Social Competence (15 years)	.085 .015*	.500** .000	.617** .000	
	824	824	824	824

* Correlation is significant at 0.05 level (2-tailed).

** Correlation is significant at 0.01 level (2-tailed).

CI: -2.73 to -.20) was very small ($\eta^2 = -0.003$). When examining the results of fourth grade scores, there was a statistically significant difference in mean social skills scores for securely attached children ($M = 58.85$, $SD = 9.77$) and insecurely attached children ($M = 56.74$, $SD = 10.36$; $t(822) = -2.93$, $p = .004$, two-tailed). The magnitude of the differences in the means (mean difference = -2.12, 95% *CI*: -3.52 to -0.69) was very small ($\eta^2 = -0.004$). Lastly, when reviewing the results of the mean social skills scores at 15 years of age there was a statically significant difference in mean social skills scores for securely attached children ($M = 58.73$, $SD = 9.73$) and insecurely attached children ($M = 56.96$, $SD = 10.43$; $t(822) = -2.45$, $p = .02$, two-tailed). The magnitude of the differences in the means (mean difference = -1.76, 95% *CI*: -3.18 to -0.35) was very small ($\eta^2 = -0.003$).

Mediation of Self-Regulation

A mediation analysis was performed using PROCESS to examine whether self-regulation at first grade mediated the relationship between children's attachment style (secure or insecure) at 36 months and social competence at first grade. As illustrated in Table 2 and Figure 1, children with more secure attachments are more likely to have greater self-regulation than those with less secure (insecure) attachments ($a = 0.526$) and children with greater self-regulation have more social competence than those with less self-regulation ($b = 2.166$). A 95% bias-corrected confidence interval for the indirect effect ($ab = 1.140$) based on 5,000 bootstrap samples did not included zero (0.115, 2.158), which indicates a significant indirect effect. There was no evidence that attachment had a direct effect on social competence independent of its effect on self-regulation ($c' = 0.325$, $p = 0.396$). The mediation results revealed that self-regulation mediates the effect of children's attachment style at 36 months and social competence at first grade.

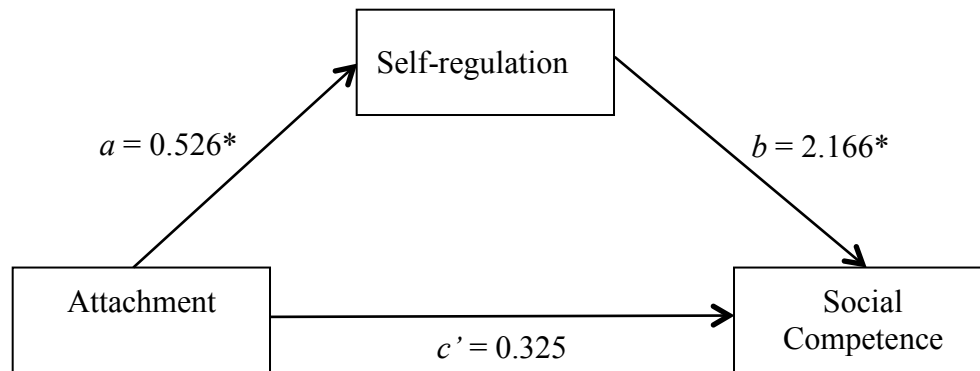
Table 2

The Mediation Analysis Results Using Bootstrapping (First grade)

		Dependent variables						
		Self-regulation			Social competence			
Predictors		Coeff.	<i>SE</i>	<i>p</i>		Coeff.	<i>SE</i>	<i>P</i>
Attachment	<i>a</i>	0.526	0.239	0.028	<i>c'</i>	0.325	0.382	0.396
Self-regulation		--	--	--	<i>b</i>	2.166	0.056	.000
		<i>R</i> ² =0.006			<i>R</i> ² =0.651			
		<i>F</i> (1, 822) = 4.852, <i>p</i> = 0.028			<i>F</i> (2, 821) = 766.447, <i>p</i> = .000			

Figure 1

Mediation Model (First grade)



* Significant at 0.05 level

Mediation model of attachment at 36 months on social competence at first grade through self-regulation at first grade.

An additional mediation analysis was performed using PROCESS to examine whether self-regulation at fourth grade mediated the relationship between children's attachment style (secure or insecure) at 36 months and social competence at fourth grade. As illustrated in Table 3 and Figure 2, children with more secure attachments are more likely to have greater self-regulation than those with less secure (insecure) attachments ($a = 0.709$) and children with greater self-regulation have more social competence than those with less self-regulation ($b = 2.442$). A 95% bias-corrected confidence interval for the indirect effect ($ab = 1.732$) based on 5,000 bootstrap samples did not include zero (0.605, 2.984), which indicates a significant indirect effect. There was no evidence that attachment had a direct effect on social competence independent of its effect on self-regulation ($c' = 0.376$, $p = 0.344$). Thus, at fourth grade, self-regulation mediated the effect of children's attachment style at 36 months and social competence at fourth grade.

A third mediation analysis was performed using PROCESS to examine if self-regulation at 15 years of age mediated the relationship between children's attachment style at 36 months and social competence at 15 years of age. The analysis revealed that children with more secure attachments are more likely to have greater self-regulation than those with less secure (insecure) attachments ($a = 0.627$) and children with greater self-regulation have more social competence than those with less self-regulation ($b = 2.291$), as illustrated in Table 4 and Figure 3. A 95% bias-corrected confidence interval for the indirect effect ($ab = 1.437$) based on 5,000 bootstrap samples included zero (0.269, 2.596), which indicated a significant indirect effect. There was no evidence that attachment had a direct effect on social competence independent of its effect on self-regulation ($c' = 0.326$, $p = 0.455$). Thus, self-regulation at 15 years of age mediates the effect of children's attachment style at 36 months and social competence at 15 years.

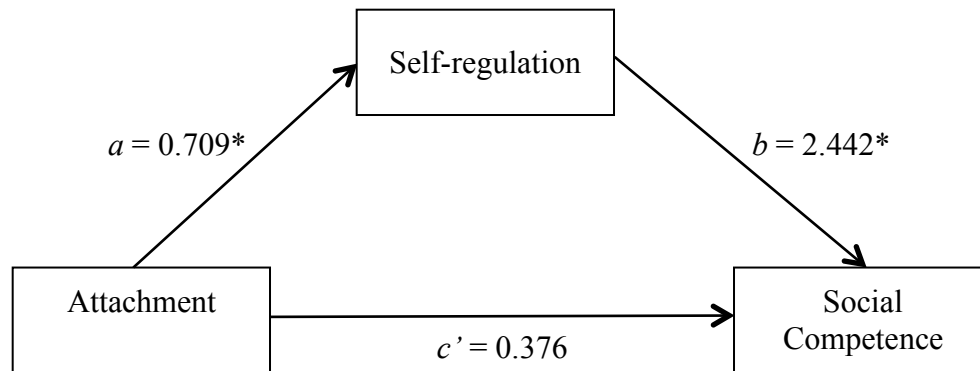
Table 3

The Mediation Analysis Results Using Bootstrapping (Fourth grade)

		Dependent variables						
		Self-regulation			Social competence			
Predictors		Coeff.	<i>SE</i>	<i>p</i>		Coeff.	<i>SE</i>	<i>p</i>
Attachment	<i>a</i>	0.709	0.247	0.004	<i>c'</i>	0.376	0.396	0.343
Self-regulation		--	--	--	<i>b</i>	2.442	0.056	.000
		<i>R</i> ² =0.01			<i>R</i> ² =0.704			
		<i>F</i> (1, 822) = 8.240, <i>p</i> = .004			<i>F</i> (2, 821) = 977.528, <i>p</i> = .000			

Figure 2

Mediation Model (Fourth grade)



* Significant at 0.05 level

Mediation model of attachment at 36 months on social competence at fourth grade through self-regulation at fourth grade.

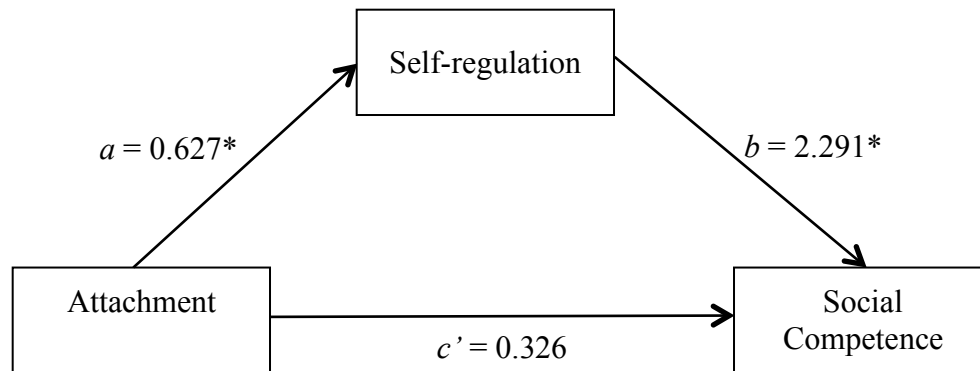
Table 4

The Mediation Analysis Results Using Bootstrapping (15 years)

		Dependent variables						
		Self-regulation			Social competence			
Predictors		Coeff.	<i>SE</i>	<i>p</i>		Coeff.	<i>SE</i>	<i>p</i>
Attachment	<i>a</i>	0.627	0.251	0.023	<i>c'</i>	0.326	0.437	0.455
Self-regulation		--	--	--	<i>b</i>	2.291	0.061	.000
		<i>R</i> ² =0.008			<i>R</i> ² =0.639			
		<i>F</i> (1, 822) = 6.251, <i>p</i> = 0.013			<i>F</i> (2, 821) = 725.478 <i>p</i> = .000			

Figure 3

Mediation Model (15 years)



* Significant at 0.05 level

Mediation model of attachment at 36 months on social competence at 15 years of age through self-regulation at 15 years of age.

CHAPTER 5: DISCUSSION

The purpose of this study was to explore the role self-regulation plays in mediating the relationship between early attachment style at 36 months of age and social competence at first grade, fourth grade, and 15 years of age. There were 824 participants in the study, with 518 participants classified as having a secure attachment and 306 participants identified as having an insecure attachment style. Of the 824 participants, 4.7% of the participants were classified as avoidant, 62.9% were classified as secure, 15.8% were identified as ambivalent/resistant and 16.6% were described as insecure other (includes children with disorganized attachments). These results are comparable to the U.S. Department of Health and Human Services' (USDHHS) percentages identified by Colin, Low and Associates (1991). As noted by the USDHHS, for most samples, approximately 20% of participants are classified as avoidant, 65% of the participants are labeled securely attached, 10 to 15% are identified as ambivalent and the final 10 to 15 % are categorized as disorganized (Colin, Low & Associates, 1991). The current data percentages, which are in accordance with other samples, seem to provide an accurate portrayal of the population, contributing to external validity.

The first analysis explored the relationship between attachment style (secure and insecure) and social competence across development (at first grade, fourth grade, and 15 years of age). When examining these two variables, attachment style demonstrated a small, yet significant association with social competence at all three time points. This finding is consistent with Bohlin, Hagekull and Andersson's (2005) finding that attachment security contributes to social competence. That is, children with secure relationships tend to exhibit more socially competent behaviors such as perspective taking, communication, empathy, affect regulation and social problem solving (Rubbin, Bukowski & Parker, in press, as cited in Rose-Kransnor, 1997). This

finding is also in congruence with Bohlin and colleagues' (2005) conclusion that insecure attachments are associated with social withdrawal, poor peer relations, possible internalizing behaviors and difficulty empathizing. All of which are signs of lagging social competence. Furthermore, Barone and Lionetti's (2012) research suggest that children with insecure attachment styles are less competent in social interactions and present more internalizing features, which is also in accordance with the findings of the current study. Thus, the current study's conclusions bolster past research findings.

However, it is important to note that although the findings of the first research question were significant, the association was weak. This weak association suggests that attachment style is one of the many factors that likely influence children's social competence. That is, other factors such as the child's social environment may influence his or her behavior in addition to the attachment relationship. Although, social learning theory was not the dominate theoretical frame for this research study, social learning theory offers an alternative lens to understand the process by which children may begin to internalize behaviors they observe. According to social learning theory, as children develop, observe, and engage, they begin to internalize the behaviors they observe (Bandura, 1971). In other words, if a child's significant figures demonstrate socially competent behaviors the child is likely to employ some of the same effective tactics. In contrast, if significant figures employ maladaptive social skills it is possible the child will demonstrate maladaptive social skills. Therefore, the child's social environment may help explain his or her degree of social competence.

Examining insecure and secure attachments and the respective mean SSRS scores at each time point, yielded a statistically significant difference in mean social skills scores between the two groups at first grade, fourth grade, and 15 years of age. This finding appears to support the

findings that insecure attachments are linked to difficulty with emotion regulation (Mills-Koonce, Pooper & Barnett, 2012), over-regulation of emotions (Martins et al., 2012), catastrophizing, and difficulty with problem solving/coping (Brumariu, Kerns & Seibert, 2012). All of which can pose problems when an individual is trying to establish and/or maintain social relationships. The ability to establish and/or maintain social relationships is an indicator of an individual's social competence. However, because the statically significant difference is small perhaps other variables are more influential to social competence. One possible explanation is that other factors, such as child characteristics, are better at predicting social competence. Based on the empirical literature regarding the influence of self-regulation in the development of social competence, it is likely that self-regulation predicts social competence better than attachment style. In fact, Eisenhower, Baker, and Blancher (2007) found that self-regulation predicted later social competence and relationships with peers and teachers. Davidov and Grusec (2006) also found that children who have the ability to self-regulate experience more positive peer interactions and fewer peer confrontations than children who lack effective self-regulatory skills. Therefore, self-regulation appears to be directly tied to social competence and could explain the small yet significant differences in mean scores with regards to attachment style, which was confirmed through the following mediation analyses.

Based on the review of literature, it was hypothesized that self-regulation may aid in explaining the association between early attachments and later social competence. This is because recent and past research on self-regulation support the hypothesis that self-regulation is associated with social competence and attachment style is associated with self-regulation. Moreover, some past research has linked attachment and social competence either directly or indirectly. However, to date no one has explored the plausible hypothesis that self-regulation

mediates the relationship between attachment and social competence. Thus, the current study aimed to support or refute the latter theory, and indeed self-regulation at first grade, fourth grade, and 15 years significantly mediates the relationship between attachment style (secure and insecure) at 36 months and social competence at first grade, fourth grade, and 15 years of age. This result is important, because it highlights one of the mechanisms by which early attachment indirectly contributes to later social competence. Thus, an awareness of the role self-regulation plays provides practitioners an avenue to enhance children and adolescents' social competence, as social competence is linked to positive outcomes such as positive peer and teacher relationships (i.e. Spritz, Sandberg, Maher & Zajdel, 2010) and less inappropriate classroom behavior (i.e. Garner & Waajid, 2012). Thus, if practitioners work to strengthen self-regulatory skills, gains in other areas are likely to develop even with early childhood insecure attachments.

Interestingly, none of the models yielded a direct relationship between attachment and social competence, which seems counter intuitive when considering Anisworth's paradigm that attachment is pivotal to social development and other more recent empirical research noting the influence of attachment on social competence (e.g. Diener, Isabella, Behunin & Wong, 2008; Booth-Laforce, Oh, Kim, Rubin, Rose-Krasnor & Burges, 2006). However, there appears to be several likely explanations for these mediation results. It is possible that using data provided by the child's parent/primary caregiver biased the SSRS scores. Perhaps the parent minimized the child's social competence as opposed to over rating the child's social competence. Alternatively, it is possible that other factors mediate the relationship between attachment and social competence, which would explain why a direct effect was not found. That is, as noted in previous studies, sensitive care (Belsky & Fearon, 2002), maternal expressiveness (Laible, 2006), parental responsiveness (Rispoli, McGoe, Koziol & Shreiber 2012) and other parental

factors (Isabella & Diener, 2010) mediate the relationship between attachment and social competence. Thus, such findings buttress the current study's conclusion that attachment does not directly relate to social competence.

Summary

Attachment style (insecure and secure) at 36 months of age is associated with social competence at first grade, fourth grade, and 15 years of age. Moreover, the difference between mean social skills scores for the two groups was significant at each time point. Thus, after discovering a positive relationship between attachment and social competence and determining the mean social skills scores were significantly different between the groups, the next goal was to account for the other plausible factors for explaining social competence. Therefore, the current study explored self-regulation as a mediating variable. Results demonstrate that self-regulation at first grade, fourth grade, and 15 years mediates attachment style (secure and insecure) at 36 months of age and social competence at first grade, fourth grade, and 15 years, respectively. That is, self-regulation is an important variable in explaining the relationship between early attachment and social competence at first and fourth grade.

Limitations

There are several limitations of the current research. First, majority of the sample were children identified as having secure attachments. The unequal sample sizes are likely to increase the chance of making a type II error. Secondly, the distribution of participants identified as having insecure attachments varied for each of the insecure attachment styles. Only 39 children classified as insecure avoidant participated, while 130 and 137 identified as ambivalent/resistant and insecure other, respectively. This unequal distribution is problematic because the three unique types of insecure attachments have been associated with different behavioral outcomes,

which may skew results. Thirdly, the insecure other category included children identified as disorganized as well as children who were classified as controlling. According to the NICHD SECCYD, children identified as insecure controlling/other either take control of the reunion or show combinations of attachment styles during reunions. Although these combination attachment styles are ordinarily identified as insecure disorganized, they were also lumped in with another category, controlling. A distinct category for children with insecure disorganized attachments may uncover difference in insecure attachments with regards to social competence. A fourth limitation of the study involves the SSRS measure. As noted previously, the self-control subscale assess “behaviors that emerge in conflict situations such as responding or speaking in an appropriate way, receiving criticism well, and controlling temper” (NICHD, 2003a), thus it is possible discrepancies exist between the behaviors that encompass self-control and the behaviors that qualify as self-regulatory. A final limitation of the current study is that the social competence and self-regulation scores were reported by the children’s parents/alternate caregiver, which could lead to biased reports, as parents are more likely to view their child favorably.

Future Research

Examining each insecure attachment style may provide greater insight into the impact of self-regulation on the relationship between early insecure attachment styles and later social competence. It is possible that one insecure attachment style may demonstrate more maladaptive self-regulation and thus abate social competence. An awareness of the latter may act as a bedrock for intervention strategies, with the objective of improving self-regulatory behavior. It would also be interesting to explore possible variables that may influence early attachment and social competence across development. Taking this notion a step further, examining the significance of

change across time may provide a clearer picture as to what extent age plays in the relationship among attachment style, self-regulation, and social competence.

Conclusion

While self-regulation is supported in research as an influential factor in social competence and attachment style is noted as an influential factor in self-regulation, it seems plausible to hypothesize that self-regulation would mediate the relationship between insecure attachment styles and social competence. This hypothesis in fact, was supported by the current study. That is, self-regulation at first grade, fourth grade, and 15 years, mediates attachment style at 36 months of age and social competence at first grade, fourth grade and 15 years of age, respectively.

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APPENDIX A: IRB Approval



EAST CAROLINA UNIVERSITY
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Office **252-744-2914** · Fax **252-744-2284** · www.ecu.edu/irb

Notification of Exempt Certification

From: Social/Behavioral IRB
To: [Brittany Goss](#)
CC: [Sandra Triebenbacher](#)
Date: 1/21/2014
Re: [UMCIRB 13-002449](#)
The Influence of Attachment and Self-regulation on Children's Social Competence

I am pleased to inform you that your research submission has been certified as exempt on 1/21/2014. This study is eligible for Exempt Certification under category #4.

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

The UMCIRB office will hold your exemption application for a period of five years from the date of this letter. If you wish to continue this protocol beyond this period, you will need to submit an Exemption Certification request at least 30 days before the end of the five year period.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.